L Number	Hits	Search Text	DB	Time stamp
1	457	hardmask and (opening or hole or trench or recess)	USPAT; US-PGPUB	2003/04/18 10:54
2	94	(hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask))	USPAT; US-PGPUB	2003/04/18 10:54
3	35	hardmask and (opening or hole or trench or recess)	EPO; JPO; DERWENT; IBM_TDB	2003/04/18 08:44
4	2	(hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask))	EPO; JPO; DERWENT; IBM_TDB	2003/04/18 08:45
5	33	(hardmask and (opening or hole or trench or recess)) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))	EPO; JPO; DERWENT; IBM_TDB	2003/04/18 08:45
6	3910	438/624,634,637,692,717,736.ccls.	USPAT; US-PGPUB	2003/04/18 10:39
8	2119	438/624,634,637,692,717,736.ccls. and (hardmask or mask)	USPAT; US-PGPUB	2003/04/18 10:44
9	914	438/624,634,637,692,717,736.ccls. and (thickness same (hardmask or mask))	USPAT; US-PGPUB	2003/04/18 10:44
10	904	(438/624,634,637,692,717,736.ccls. and (thickness same (hardmask or mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))	USPAT; US-PGPUB	2003/04/18 08:56
11	865	((438/624,634,637,692,717,736.ccls. and (thickness same (hardmask or mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))) and @ad<=20020117	USPAT; US-PGPUB	2003/04/18 10:45
12	752	(((438/624,634,637,692,717,736.ccls. and (thickness same (hardmask or mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))) and @ad<=20020117) and (opening or hole or trench or recess)	USPAT; US-PGPUB	2003/04/18 10:45
14	2257	257/637,643,642,649,760,774.ccls.	USPAT; US-PGPUB	2003/04/18 10:43
15	1142	257/637,643,642,649,760,774.ccls. and (hardmask or mask)	USPAT; US-PGPUB	2003/04/18 10:44
16	443	(257/637,643,642,649,760,774.ccls. and (hardmask or mask)) and (thickness same (hardmask or mask))	USPAT; US-PGPUB	2003/04/18 10:44
18	408	((257/637,643,642,649,760,774.ccls. and (hardmask or mask)) and (thickness same (hardmask or mask))) and (opening or hole or trench or recess or via)	USPAT; US-PGPUB	2003/04/18 10:45
19	383	(((257/637,643,642,649,760,774.ccls. and (hardmask or mask)) and (thickness same (hardmask or mask))) and (opening or hole or trench or recess or via)) and @ad<=20020117	USPAT; US-PGPUB	2003/04/18 10:56
20	343	((((257/637,643,642,649,760,774.ccls. and (hardmask or mask)) and (thickness same (hardmask or mask))) and (opening or hole or trench or recess or via)) and @ad<=20020117) not ((((438/624,634,637,692,717,736.ccls. and (thickness same (hardmask or mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))) and @ad<=20020117) and (opening or hole or trench or recess))	USPAT; US-PGPUB	2003/04/18 10:46
21	2963	(hard adj mask) and (opening or hole or trench or recess)	USPAT; US-PGPUB	2003/04/18 11:13
22	595	((hard adj mask) and (opening or hole or trench or recess)) and (thickness with (hard adj mask))	USPAT; US-PGPUB	2003/04/18 10:55

23	586	(((hard adj mask) and (opening or hole or trench or recess)) and (thickness with (hard adj mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))	USPAT; US-PGPUB	2003/04/18 10:55
24	490	((((hard adj mask) and (opening or hole or trench or recess)) and (thickness with (hard adj mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))) not ((((438/624,634,637,692,717,736.ccls. and (thickness same (hardmask or mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))) and @ad<=20020117) and (opening or hole or trench or recess))	USPAT; US-PGPUB	2003/04/18 10:56
25	479	(((((hard adj mask) and (opening or hole or trench or recess)) and (thickness with (hard adj mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))) not ((((438/624,634,637,692,717,736.ccls. and (thickness same (hardmask or mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))) and @ad<=20020117) and (opening or hole or trench or recess))) not (((((257/637,643,642,649,760,774.ccls. and (hardmask or mask)) and (thickness same (hardmask or mask))) and (opening or hole or trench or recess or via)) and @ad<=20020117) not ((((438/624,634,637,692,717,736.ccls. and (thickness same (hardmask or mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))) and @ad<=20020117) and (opening or hole or trench or recess)))	USPAT; US-PGPUB	2003/04/18 10:56
26	415	((((((hard adj mask) and (opening or hole or trench or recess)) and (thickness with (hard adj mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))) not ((((438/624,634,637,692,717,736.ccls. and (thickness same (hardmask or mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))) and @ad<=20020117) and (opening or hole or trench or recess))) not (((((257/637,643,642,649,760,774.ccls. and (hardmask or mask)) and (thickness same (hardmask or mask))) and (opening or hole or trench or recess or via)) and @ad<=20020117) not ((((438/624,634,637,692,717,736.ccls. and (thickness same (hardmask or mask))) not ((hardmask and (opening or hole or trench or recess)) and (thickness with (hardmask)))) and @ad<=20020117) and (opening or hole or trench or recess)))) and @ad<=20020117	USPAT; US-PGPUB	2003/04/18 10:56
27	499	(hard adj mask) and (opening or hole or trench or recess)	EPO; JPO; DERWENT; IBM_TDB	2003/04/18 11:17
30	491	((hard adj mask) and (opening or hole or trench or recess)) not (hardmask and (opening or hole or trench or recess))	EPO; JPO; DERWENT; IBM_TDB	2003/04/18 11:18
33	63	(((hard adj mask) and (opening or hole or trench or recess)) not (hardmask and (opening or hole or trench or recess))) and thickness	EPO; JPO; DERWENT; IBM_TDB	2003/04/18 11:18

DOCUMENT-IDENTIFIER: US 20020081834 A1

TITLE: Method for eliminating reaction between photoresist and OSG

---------- KWIC ---------

[0184] Suitable hardmask layer materials nonexclusively include CVD films such as SiO2, SiN, SiON, SiOC, SiC, spin on polymers such as spin on glass, chromophore laden SOG, organic spin on polymers, hydrogen silsesquioxane, methyl silsesquioxane and metals such as Ta, TaN . Preferably, the hardmask layer material is SiO.sub.2, SiON, SiN, or SiC. Most preferably, the first hardmask layer comprises SiO.sub.2, and the second hardmask layer comprises Si.sub.3N.sub.4. Although this application refers only to first and second hardmask layers, a plurality of hardmask layers be used in the practice of the present invention. The hardmask layers may be deposited by conventional means such as CVD, spin-on, evaporation, sputtering, atomic layer epitaxy. The **thickness of the hardmask** layers may be the same or different, and may vary depending on the deposition procedure and parameter setup. The thicknesses preferably range from about 100 .ANG. to about 5000 .ANG., more preferably from about 200 .ANG. to about 3000 .ANG., and most preferably from about 400 .ANG. to about 1500 .ANG..

DOCUMENT-IDENTIFIER: US 20020052125 A1

TITLE: Organosilicate resins as hardmasks for organic polymer dielectrics in fabrication of microelectronic devices

---------- KWIC ---------

[0066] After applying (the application step may include a bake step to remove residual solvent) and, optionally, curing the first layer, the organosilicate material is applied. Any known coating process may be used, such as vapor deposition of monomers, spin coating, dip coating, spray coating, etc. However, spin coating of an oligomer or low molecular weight polymer solution is preferred. The thickness of the organosilicate layer is preferably greater than 50 Angstroms (5 nm), more preferably greater than 100 Angstroms. Preferably, the layer has a **thickness** of less than about 1000 Angstroms for a top hardmask and less than about 500 Angstroms for an embedded hardmask. According to a first embodiment, the organosilicate material is cured, preferably at temperatures of 50 to 500, more preferably 100 to 400.degree. C. for 0.1 to 60 minutes. The precise temperatures will depend on the organosilicate material selected. A photoresist is applied over the organosilicate material. The photoresist is imaged and developed according to conventional methods to remove a portion of the photoresist exposing a pattern on the hardmask. The organosilicate hardmask may then be etched to expose a portion of the first layer dielectric. Etching of the organosilicate hardmask may occur by variety of methods, such as wet etch (e.g., electrochemical, photoelectrochemical or open circuit etching) or dry etch (e.g., vapor, plasma, laserbeam, e-beam, ion) techniques as described in Etching in Microsystems, Michael Kohler, Wiley-VCH. The photoresist may be removed during etching or in a separate removal step. The exposed portion of the first dielectric layer may then be etched by such methods as wet or dry etching to form a trench, via or

other desired feature. If desired, a second organic polymer layer may then be applied and cured over the patterned organosilicate layer. A second hardmask of any type, but preferably again an organosilicate, may be applied over the second organic polymer layer and patterned according to standard processes. The organic polymer can then be etched down to the embedded hardmask or etch stop and where a pattern has been opened in the embedded hardmask, down through the first layer of organic polymer.

US-PAT-NO: 6372653

DOCUMENT-IDENTIFIER: US 6372653 B1

TITLE: Method of forming dual damascene structure

---------- KWIC ---------

As shown in FIG. 2B, a first **mask** layer 208 and a second **mask** layer 210 are formed sequentially over the dielectric layer 206. The **mask** layer 208 and the dielectric layer 202 have different etching rates. The first **mask** layer 208 has a **thickness** of between 500 .ANG. to 2000 .ANG. and can be an aluminum nitride layer formed, for example, by physical vapor deposition. The second **mask** layer 210 has a different etching rate than that of the other layers, including the first **mask** layer 208, the dielectric layer 206, the diffusion layer 204 and the dielectric layer 202. The second **mask** layer 210 has a **thickness** of between 1000 .ANG. to 2000 .ANG. and can be a tungsten nitride formed, for example, by chemical vapor deposition. A photoresist layer having a trench pattern 214 is formed over the second **mask** layer 210 for patterning the second **mask** layer 210.

US-PAT-NO: 6309962

DOCUMENT-IDENTIFIER: US 6309962 B1

TITLE: Film stack and etching sequence for dual damascene

---------- KWIC ---------

A commonly used process of the poor art for forming the damascene cavities begins as illustrated in FIG. 1. The low k organic dielectric is actually formed from two layers 2 and 4, of roughly equal **thickness**, separated by an etch stop layer 3 of a material such as silicon oxide. These coat the top surface of partially formed integrated circuit wafer 1. A hard **mask** 5 of a single layer of silicon oxynitride, on the top surface of 4, has been etched to define, and then used to form, partial via hole 16 (diameter a) which extends as far as etch stop layer 3. Dielectric 8 separates layers 1 and 2.

Next, a three layer hard **mask** is laid down over the IMD. The three layers, deposited in sequence, are silicon oxynitride layers 45 and 47, separated by silicon oxide layer 46. Silicon oxynitrde layer 47 was deposited to a **thickness** between about 0.1 and 0.3 microns while layer 45 was deposited to a **thickness** between about 0.1 and 0.3 microns. The layer of silicon oxide 46 was deposited to a **thickness** between about 0.1 and 0.3 microns. We note here that a three layer, or even a two layer, hard **mask** is not an essential feature of the present invention. Thus, a hard **mask** composed of 0.1-0.3 microns silicon oxynitride on 0.1-0.3 microns of silicon oxide would be effective as would a single layer **mask** of 0.2-0.6 microns of silicon oxynitride. The three layer structure is preferred because it makes the etching step easier.

Next, a three layer hard **mask** is laid down over the IMD. The three layers, deposited in sequence, are silicon oxynitride layers 45 and 47, separated by silicon oxide layer 46. Silicon oxynitride layer 47 was deposited to a **thickness** between about 0.1 and 0.3 microns while layer 45 was deposited to a **thickness** between about 0.1 and 0.3 microns. The layer of silicon oxide 46 was deposited to a **thickness** between about 0.1 and 0.3 microns.